

07.1-4 CRYSTAL GROWTH AND DESTRUCTION IN THE Cu-S SYSTEM. By M.M. Kazinets, The Institutes for Applied Research, Ben-Gurion University of the Negev, Beer-Sheva 84110, Israel

The compounds  $\text{Cu}_2\text{S}$  and  $\text{Cu}_{1.8}\text{S}$  were synthesized at  $1000^\circ\text{C}$  in a quartz ampule under a vacuum of about  $10^{-3}$  torr. The chosen synthesis temperature being lower than the melting point of Cu ( $1083^\circ\text{C}$ ), the reaction takes place between solid Cu and S vapor. After termination of the synthesis the surface structure of the samples was investigated with a JEOL-35CF Scanning Electron Microscope, the composition by the EDS (energy dispersive X-ray spectroscopy) method and the phase composition by powder X-ray diffraction. Crystals 200-800  $\mu\text{m}$  in size were observed on the surface of the samples.  $\text{Cu}_2\text{S}$  crystals had the form of hexagonal prisms while the crystals of  $\text{Cu}_{1.8}\text{S}$  displayed truncated octahedra with well developed (111) and (100) faces. Sometimes growth steps could be seen on the crystal faces. A process of crystal destruction was observed on the  $\text{Cu}_{1.8}\text{S}$  with discernible destruction figures—quadrangular pyramids, truncated quadrangular pyramids and right-angled prisms on the (100) face and triangular pyramids and prisms on the (111) face. Transformation from right-angled prisms to mushroom-shaped figures was observed on the (100) faces. The crystal growth on the sample surface during synthesis can be due to vapor-phase reaction of S with solid Cu and material transport by sublimation from warmer to cooler parts of the sample. The simultaneity of both processes—crystal growth and destruction may be connected with a steady temperature gradient along the sample diameter. The local temperature fluctuations on the different faces of the crystals lead to the simultaneous appearance of all the stages of the destruction process. One might attempt to explain the stability of some faces of the crystals during destruction in terms of the periodic bond-chain theory.

07.1-5 A NEW CRYSTAL GROWTH FORM OF VATERITE  $\text{CaCO}_3$ . By A.M. Shaikh & D.J. Shearman, Geology Department, University of Kuwait

An unusual growth form of vaterite,  $\text{CaCO}_3$  (rhombohedral), was obtained in the laboratory by decomposition of crystals of ikaite  $\text{CaCO}_3 \cdot 6\text{H}_2\text{O}$  (monoclinic). The purpose of the experiment was to grow crystals of ikaite at temperatures close to  $0^\circ\text{C}$ , allow them to decompose to calcium carbonate and water at normal laboratory temperature to see whether the ikaite crystals would become pseudomorphed in calcite. The reason for doing that was to try to gather supporting evidence for the current suggestion that ikaite was the precursor mineral of the calcite pseudomorphs known as jarrowites, thinolites, glendonites and gennoishi etc. The ikaite crystals did become pseudomorphed in calcium carbonate, but XRD analysis proved the carbonate to be dominantly vaterite with a small proportion of calcite. Scanning electron micrographs showed that the microcrystalline vaterite occurred as arborescent aggregates 30 to 40  $\mu\text{m}$  in size. This growth form of vaterite does not appear to have been described before.

Vaterite is an extremely rare mineral in sedimentary rocks, a fact which is not surprising in view of its poor stability. What is of interest is that the overall shape of new growth form is reminiscent of that of some dendritic calcite tufas, although on a smaller scale. The morphological similarity opens the possibility that some dendritic tufas, such as those associated with the Quaternary Lake Lahontan, Nevada, may have been deposited as vaterite that rapidly changed to calcite but preserved the original growth form.

07.1-6 SURFACE MORPHOLOGY OF MELT GROWN  $\text{CdI}_2$  SINGLE CRYSTALS

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$\text{CdI}_2$  has been purified by the zone-refining technique by giving 20 passes. Single crystals of this material were grown by this technique. X-ray diffraction studies showed that the final ingot was single crystalline. These crystals were found to be the 4H polytype structure. Sections of crystals cleaved from the ingot were used to study the surface morphology of these crystals using an optical microscope. In the present investigation growth spirals have been observed in these melt grown crystals. Spiral growth has been observed very frequently only in solution and vapour grown  $\text{CdI}_2$  single crystals. The presence of growth spirals has been investigated in relation to the growth mechanism of  $\text{CdI}_2$  single crystals.

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07.1-7 CRYSTAL GROWTH AND SUPERCONDUCTIVITY OF  $\text{Nb}_3\text{Sn}$ ,  $\text{Nb}_3\text{Al}$ ,  $\text{Nb}_3\text{Al}_{.75}\text{Ge}_{.25}$  AND  $\text{Nb}_2\text{Al}$ . By Kim Christensen and Svend Erik Rasmussen. Department of Inorganic Chemistry, Aarhus University, DK-8000 Aarhus C, Denmark.

Small single crystals of  $\text{Nb}_3\text{Sn}$  have been grown from the melt. Niobium tubes were used to confine the melt and to prevent evaporation of Sn. Crystals of size up to  $1 \times 1 \times 0.1$  mm were found. Bulk samples showed onset of superconductivity at 16.6K. Low temperature powder photographs showed the well-known cubic-to-tetragonal phase transition which is being investigated further by single crystal methods. Crystals of the niobium-aluminium and niobium-aluminium-germanium compounds were grown by floating zone methods. In these cases  $\text{Al}_2\text{O}_3$  tubes were used to confine the melts and to prevent evaporation of aluminium. Single crystals big enough for X-ray diffraction were not obtained for  $\text{Nb}_3\text{Al}$  whereas crystals of size up to  $1 \times 1 \times 1$  mm<sup>3</sup> were obtained for the ternary composition  $\text{Nb}_3\text{Al}_{.75}\text{Ge}_{.25}$ . The sigma phase  $\text{Nb}_2\text{Al}$  yielded crystals that were twinned of size  $0.5 \times 0.5 \times 0.1$  mm. Sintered  $\text{Nb}_3\text{Al}$  became superconducting at 10.6-11.5K and  $\text{Nb}_3\text{Al}_{.75}\text{Ge}_{.25}$  at 16.2-19.0K.  $\text{Nb}_2\text{Al}$  did not exhibit a transition to superconductivity down to 7.5K. Low temperature powder photographs taken near the transition temperature of  $\text{Nb}_3\text{Al}$  and  $\text{Nb}_3\text{Al}_{.75}\text{Ge}_{.25}$  showed no signs of a phase transition. Neither did single crystal diffractometer measurements on  $\text{Nb}_3\text{Al}_{.75}\text{Ge}_{.25}$ . The stoichiometries given are for idealized structures. In reality, the compounds are non-stoichiometric.